

REMARKS

Reconsideration of this application in light of the present amendment and remarks is respectfully requested.

Claims 1, 2 and 4-20 have been rejected.

Claims 1, 11 and 18 have been amended.

Claims 1, 2 and 4-20 are pending in this application.

Claims 1, 2 and 8-10 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Taniguchi et al. (US5162928), hereinafter "Taniguchi" in view of Matsumoto et al. (US5748377), hereinafter "Matsumoto." Claims 4-7, 11, 12, 15, 16, and 18-20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Taniguchi in view of Stringfellow (US6359737), hereinafter "Stringfellow." Claims 13, 14, and 17 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Taniguchi in view of Stringfellow in further view of Matsumoto. Independent claims 1, 11, and 18 have been amended. Reconsideration of the pending claims is respectfully requested.

As explained in the background of the present invention, a need exists for reducing the size, weight, cost, number of optical and electronic components, and, at the same time, improve both brightness and contrast in heads-up displays. [Application, Page 1, lines 7-9] As mentioned in the background of the application, one approach that had been used was to use an infrared laser source and a non-linear crystal both for infrared light conversion to visible and for light diffusion purpose in the intermediate image plane. [Application, Page 1, lines 21-23] This is the approach taken in the cited prior art reference of Taniguchi.

As shown in FIG. 2 of Taniguchi, the reference number 1 designates a laser radiating a coherent laser beam of a certain wavelength, the reference number 2 denotes a light deflector having a galvano mirror and scanning the laser beam entering it, and the reference number 3 designates a non-linear optical device which is a device producing high-order harmonic such as a 2nd order or 3rd order harmonic. [Taniguchi, Col. 3, lines 44-51] The non-linear optical device 3 in Taniguchi is described as "formed of a material which is capable of producing high-order harmonic (beam) and in which the wavelength λ_2 of said harmonic is within the visible light

range, for example, single crystal of an inorganic or organic compound, crystal powder, or powder particles of inorganic crystal or organic crystal dispersed into a high molecular compound or the like and made into a mixed system.” [Taniguchi, Col. 5, lines 16-25]

Non-linear crystals, however, are both prohibitive cost-wise to be employed in an HUD and have very low (a few percent) conversion efficiency. [Application, Page 1, lines 23-24] As explained in the Applicants’ Application, the approach (such as the one taken in Taniguchi) has practical limitations as to get conversion efficiencies from infrared to visible light of more than ten percent, using a typical non-linear crystal with the length of the order of one centimeter, the infrared light intensities of the order of 10MWt/cm^2 are needed. [Application, Page 1, line 24 – Page 2, line 1] To achieve that, a tight focusing of the laser beam on the crystal is required, which, in turn, superimposes a strict requirement on the value of the allowable deviation angle from the direction of phase-matching condition. [Application, Page 2, lines 1-4]

Matsumoto describes a heads-up display that includes a series of reflective mirrors. [Matsumoto, Figures 6, 7, 9-11, Col. 4, lines 16-27; Col. 35, lines 35-47; Col. 5, lines 53-62; Col. 6, lines 4-14; Col. 6, lines 15-22] Figure 8 of Matsumoto describes a cylindrical lens 28 for the use of a reflection-type hologram having an elliptic distribution. However, the lens 28 is not described in the context of providing optical gain of an image as configured and recited in the amended claims. [Col. 5, lines 42-52]

Stringfellow describes a heads-up display that also includes a series of reflective mirrors. [Stringfellow, Figures 2 and 3, Col. 3, lines 56-66]

Independent claims 1, 11, 18 have been amended to recite that the intermediate means for diffusing light includes a lens for passing the image through the lens and providing optical gain for the image. Claims 11 and 18 provide for adjustable gain to the generated image. Support for the added recitation can be found in the Application:

Preferably, the means to diffuse the light 12 is a diffusing element that provides optical gain for the image 16 thereon. For a better light uniformity, a Fresnel lens can be incorporated with the diffuser element. The higher the gain provided by the diffuser element, the smaller the exit cone of light from the diffuser element. In practice, gains of from two to one-hundred can be easily provided from the diffuser element. Gains of

about fifty-seventy times, along the perpendicular axis of the diffuser are preferred. The use of gain provides a much brighter image along the optical path for the driver 22 of the vehicle.

[Application, page 4, lines 25-31 (see also page 6, lines 14-20; page 8, line 28 – page 9, line 6; page 10, lines 15-20)]

As explained above, none of the cited references teach or suggest a system that has a means of diffusing light that receives the visible light from the image source for projection where the diffusion means includes a lens for passing the image through the lens and providing optical gain for the image. It is respectfully submitted that putting a control element with a gain and exiting light cone angle in the intermediate image plane of a laser scanner heads-up display is not taught in the cited prior art references. The benefit of the recited claims is that it allows for a substantial decrease in the complexity, size, and weight of either refractive or reflective projection optics elements that follow in the optical path.

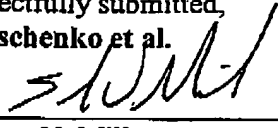
For at least the foregoing reasons, Applicants respectfully request reconsideration of the pending rejections. Claims 2, 4-10 depend either directly or indirectly from claim 1 and are believed to be allowable over the cited references for at least the same reasons as claim 1. Claims 12-17 depend either directly or indirectly from claim 11 and are believed to be allowable over the cited references for at least the same reasons as claim 11. Claims 19-20 depend either directly or indirectly from claim 18 and are believed to be allowable over the cited references for at least the same reasons as claim 18. *See In re Fine*, 837 F.2d at 1076 (If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious.).

As the Applicant has overcome all substantive rejections and objections given by the Examiner and have complied with all requests properly presented by the Examiner, the applicants contend that this Amendment, with the above discussion, overcomes the Examiner's objections to and rejections of the pending claims. Therefore, the applicants respectfully solicit allowance of the application. If the Examiner is of the opinion that any issues regarding the status of the claims remain after this response, the Examiner is invited to contact the undersigned representative to expedite resolution of the matter.

The Commissioner is hereby authorized to charge any necessary fee, or credit any overpayment, to Motorola, Inc. Deposit Account No. 50-2117.

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